tion section part of the more volatile component Y transfers from the liquid phase to the vapor phase, and part of the less volatile component X transfers from the vapor phase to the liquid phase. The vapor phase, which is progressively enriched with the more volatile component Y, flows through distillation column or apparatus **110** towards the microchannel condenser **120** and into the microchannel condenser **120**. The liquid phase, which is progressively enriched with the less volatile component X, flows through the distillation column **100** towards the microchannel reboiler **130** and into the microchannel reboiler **130**. The vapor phase is condensed in the microchannel condenser **120** to form distillate product D. Part of the distillate product D, which may be referred to as an overhead product (sometimes called a head or a make), may be withdrawn from the system, as indicated by arrow **122**. Part of the distillate product D may be returned to the distillation column or apparatus **110** where it flows through the distillation column in the form of a liquid phase. The liquid phase, in the form of bottoms product B, flows into the microchannel reboiler **130**. Part of the bottoms product B may be withdrawn from the system, as indicated by arrow **132**. Part of the bottoms product may be vaporized in the microchannel reboiler **130** and returned to the distillation column or apparatus **110** where it flows through the distillation column or apparatus **110** in the form of a vapor phase. The ratio between the amount of distillate product D that is removed from the system and the amount that is returned to the system may be referred to as the reflux ratio. The ratio between the amount of bottoms product B that is removed from the system and the amount that is returned to the system may be referred to as the boil-up ratio. These ratios can vary and can be determined by those skilled in the art.

[**0052**] The distillation process **100**A illustrated in **FIG. 2** is also suitable for conducting the inventive process. The distillation process **100**A is similar to the distillation process **100** with the exception that the distillation process **100**A is suitable for effecting separation between three components, namely, components X, Y and Z, from a feed F comprising components X, Y and Z. Components Y and Z are more volatile than component X, and component Z is more volatile than component Y. Distillation process **100**A employs two distillation columns or apparatus, namely, distillation columns or apparatus **110** and **110***a*. Distillation columns or apparatus **110** and **110***a* in **FIG. 2** function in the same manner as distillation column or apparatus **110** in **FIG. 1**. The feed F containing components X, Y and Z flows into distillation column or apparatus **110**, as indicated by line **112**. A mixture enriched with component X is separated as first bottoms product B^1. Part of the first bottoms product B^1 can be recirculated back through distillation column or apparatus **110** in the same manner as discussed above for distillation column or apparatus **110** in **FIG. 1**. The remainder of the first bottoms product B^1 is withdrawn from the system, as indicated by arrow **132**. A mixture enriched with components Y and Z is separated as a first distillate product D^1. Part of the first distillate product D^1 can be recirculated back through distillation column or apparatus **110** in the same manner as discussed above for distillation column or apparatus **110** in **FIG. 1**. The remainder of the first distillate product D^1 flows to distillation column or apparatus **110***a*, as indicated by line **122**, wherein a second distillate product D^2 enriched with component Z is withdrawn from the distillation column or apparatus **110***a*, as indicated by line **122***a*. A second bottoms product B^2 containing an enriched concentration of component Y is withdrawn from distillation column or apparatus **110***a*, as indicated by line **132***a*. The second distillate product D^2 and second bottoms product B^2 can be partially recirculated back through the distillation column or apparatus **110***a* in the same manner as discussed above for distillation column or apparatus **110** in **FIG. 1**.

[**0053**] In addition to the distillation processes illustrated in **FIGS. 1 and 2**, there are other distillation processes that are known for separating fluids for which the inventive microchannel distillation process may be employed. These include: partitioned columns; topping and tailing processes or tailing and topping processes, which employ two distillation columns; easiest separation first processes, which employ three distillation columns; and full thermal coupling processes which employ two distillation columns. These distillation processes are described in Becker et al., "The World's Largest Partitioned Column with Trays—Experiences from Conceptual Development to Successful Start-Up," Reports on Science and Technology 62/2000, pages 42-48. The microchannel distillation units used with the inventive process can be employed in these distillation processes. An advantage of using the inventive microchannel distillation units is that the distillation systems that employ the inventive microchannel distillation units can be built on smaller scales that consume significantly less energy and still produce the same level of product output as conventional distillation systems. Another advantage of using the inventive microchannel distillation units relates to the ability to closely space partitions within these microchannel distillation units or to closely space thermally coupled streams by integration of such thermally coupled streams with adjacent channels or within adjacent or nearly adjacent layers in the same microchannel distillation unit. The close spacing of the thermally coupled streams may reduce one or more of thermal response times, control feedback times, and start-up times needed for achieving steady-state operations for continuous distillation processes.

[**0054**] As is well known in the art, the number of theoretical sections for effecting a desired separation for two components in a distillation process may be calculated using the McCabe-Thiele graphical method which is illustrated in **FIG. 3**. Referring to **FIG. 3**, an equilibrium line **200** for the vapor phase and the liquid phase of component X is plotted. The operating lines **210** and **220** for a conventional distillation process are depicted in **FIG. 3** for purposes of comparison. Line **210** would be the rectifying operating line while line **220** would be the stripping operating line. The number of theoretical stages required for the distillation can be calculated using the horizontal and vertical lines extending from the rectifying line **210** and stripping line **220** to the equilibrium curve **200**. Operating line **230** which is also shown in **FIG. 3** would correspond to an operating line which more closely approaches a reversible distillation process. A process following operating line **230** would not be economical using conventional technology due to the prohibitive cost of adding separation sections and heat exchangers. While no chemical process is reversible in a thermodynamic sense, and entropy always increases, an advantage of the inventive process is that reversible distillation can be closely approached. With the inventive process, the difference in temperature between the vapor and liquid phases in each section can be minimized. A longitudinal temperature profile in the distillation column or appa-